

Pacific Northwest Project Legislative Briefing Paper Transmittal

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TO: Oregon State Legislators and Water Resources Policy Makers
FROM: Darryll Olsen, Ph.D.
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SUBJECT: The Regional Economic Significance of Columbia River Water Rights
from the McNary-John Day Pools

Innovative water resource management strategies are being developed for the issuance of new Columbia River water rights in our region. These strategies offer Eastern Oregon communities, and the state, important economic benefits that should not be overlooked.

In Eastern Oregon, access to and issuance of new water rights means protecting existing irrigated agricultural production and opening the door to further high-value industry opportunities. Irrigated agriculture is the driver for many of our key economic sectors, including direct agricultural production, agricultural services, food processing, and the broad community service sectors dependent on this industrial base. For Eastern Oregon, irrigated agriculture is instrumental to the well-being of many communities.

To highlight this important economic driver:

- Where critical groundwater areas now exist, new surface water rights will ensure the viability of about 65,000 existing irrigated acres, representing local and state income amounting to about \$143 million annually. This is a key part of local income that today protects regional economic stability.
- With the future development of about 100,000 irrigated acres during the next 20-25 years, an additional \$220 million annually will be obtained in local and state income.
- We are poised today to continue our role as economic and technical leaders in irrigated agriculture, feeding our region and nation, and serving international markets. Our region has a competitive advantage, if we act on it.

You are encouraged to read through this briefing paper in order to gain an appreciation and respect for the economic benefits available from new Columbia River water rights. Given an understanding of these benefits, it will become more apparent why water resource managers are moving forward to secure new water rights for the future.

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**The Regional Economic Significance
of Columbia River Water Rights
From the McNary-John Day Pools**

**A Legislative Briefing Paper
Prepared By**

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1.0 Summary--New Columbia River Water Rights and Potential Regional Economic Impacts Surrounding the Eastern Oregon Proposal.

1.1 The Eastern Oregon Proposal and Economic Objectives.

The Eastern Oregon water management proposal would provide for the acquisition of new Columbia River mainstem water rights, to be used for irrigation and some commercial/municipal purposes. The new water right withdrawals would supplement existing withdrawals from the McNary-John Day project pools, near the Columbia River area (see Figures 1 and 2).

The proposal allocation and application time frame would be approximately:

- 195,000 acre-ft. for replacement of groundwater in existing critical groundwater areas; for immediate acquisition and use.
- 300,000 acre-ft. for approximately 100,000 acres of new irrigated acres; for use within the next 20 to 25-year period.
- 5,000 acre-ft. for new municipal uses; for immediate future use, and within the next 20 to 25-year period.

The objective of the Eastern Oregon proposal is to sustain and enhance local and state income through the access and development of new Columbia River water rights. The economic capital used for water right development would come from the local private and public sectors.

1.2 Summary of Potential Regional Economic Impacts: Direct Net Value, Regional (Secondary) Economic Income, Local Tax Revenues, and Demand for Irrigation Ground.

1.2.1 Direct Net Economic Value¹

Direct net value is an economic measure that is usually reserved for public sector benefit-cost analyses, but it does represent the financial returns (salaries and net profit) to farm management and owners. Independently, it can depict a general sense of the economic feasibility for future project development, as perceived by the private sector.

A recent University of Washington (UW) report ² prepared for the Washington State Dept. of Ecology (WADOE), as part of the Columbia River Initiative (CRI), rendered the following conclusions:

- As a general average, the annual direct net value for new irrigation (Columbia River water source outside of the Columbia Basin Project) would likely range between \$66-74/acre-ft.
- The annual direct net value for selected high value crops, such as that grown in the Horse Heaven Hills area (or in Eastern Oregon), would be about \$155-190/acre-ft.

As part of the Columbia River Initiative (CRI) review, the Pacific Northwest Project developed estimates of direct net value, relying on irrigated versus non-irrigated land values and available water marketing information.³ This work concluded:

- The annual direct net value for new irrigation production would be about \$90/acre-ft., with a range of about \$56-124/acre-ft. The report also acknowledged that municipal uses would be greater than \$91/acre-ft.

The estimates derived by the UW and Pacific Northwest Project economists (and generally supported by other technical studies) suggest the feasibility for new, privately funded irrigation development within the McNary-John Day Pool areas:

¹ Unless otherwise noted, all dollar values are expressed in 2005 nominal dollars, based on the Gross Domestic Product, Implicit Price Deflator (Bureau of Economic Analysis, U.S. Department of Commerce).

² Huppert, Daniel, Gareth Green, William Beyers, Andrew Subtoviak and Andrew Wenzl (Huppert et. al.). "Economics of Columbia River Initiative." Final Report to the Washington Department of Ecology and CRI Economics Advisory Committee. January 13, 2004.

³ Olsen, D., and T. White. "Economic Analysis Methodology Illustration and Review: Estimating the Value of Water for Key Resource Sectors from the Mainstem Columbia River." Technical Memorandum Prepared by the Pacific Northwest Project, Kennewick, WA, for the CRI Economics Advisory Committee October 2003, and Revised April 2004.

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- The annual direct net value for the transfer of existing groundwater to surface water lands, would be about \$17,550,000; and the future direct net value for new irrigation would be anticipated to be about \$27,000,000.

1.2.2 Regional (Secondary) Average Annual Income Impacts.

Other recent work related to the McNary-John Day Pool area has provided estimates of county-state income derived from irrigation development. This income includes the direct income received from the irrigated agriculture industry (agricultural production, agricultural services, and food processing sectors) and derived from the service sectors supporting the industry.

This work appears in environmental impact and economic studies conducted by the U.S. Army Corps of Engineers, by GEI Consultants, by IRZ Consulting, and by the Pacific Northwest Project. These studies rely on conventional economic modeling approaches (IMPLAN model evaluations) to estimate direct and secondary income impacts.

The Corps of Engineers study⁴ indicated that:

- Based on an aggregated area that included irrigation from both the Oregon and Washington sides of the John Day Pool, the annual county-state income impact was about \$2,255 per irrigated acre.

In work conducted jointly with GEI Consultants, IRZ Consulting, and in separate sensitivity analyses reviewing the CRI UW economic study⁵, the Pacific Northwest Project concluded the following:

- Depending on the crop mix, the annual county-state income impact for the Horse Heaven and Eastern Oregon area potentially ranges between \$1,900 to \$2,200 per irrigated acre (estimated value range; values can be significantly higher for selected apple, cherry, and wine grape crops).

These regional studies suggest that new irrigated acreages, with modern crop mixes and some increased value added production, would likely provide additional county and state

⁴U.S. Army Corps of Engineers, "John Day Drawdown, Phase I Study." Portland District Office, USACE, April 2000 (and technical appendices).

⁵GEI Consultants and Pacific Northwest Project. "Efficiency and Economics of Riparian Buffers on Agricultural Lands, State of Washington," Report prepared for the WA State Dept. of Ag./Fish/Water Project, Portland, Oregon, 2002; IRZ Consulting and Pacific Northwest Project. "Economic Impacts Study for Eastern Oregon, Opportunity Costs of Columbia River Management Actions," Report prepared for the Tri-Ports and the Oregon Economic Development Dept., IRZ-PNP, Hermiston, Oregon, October 1998; and related IMPLAN and income sensitivity analyses conducted by Pacific Northwest Project using Corps 2000 data. Also see Pacific Northwest Project. "Electric Power Rate Impacts and Economic Changes Affecting the Northwest Irrigated Agriculture Industry," Technical Memorandum prepared for Northwest Irrigation Utilities, Portland, Oregon, 2005.

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income of about \$2,200 per acre. For the Eastern Oregon proposal, the anticipated county and state income impact would be:

- About \$143,000,000 annually for lands affected by groundwater to surface water transfers.
- About \$220,000,000 annually for new irrigated lands (using current dollar values for the total development over time).

1.2.3 Local/State Tax Revenues.

With existing irrigated acreages and additional acreages provided from new Columbia River water withdrawals, the local county tax impact would be approximately:

- For existing acreages converted from groundwater to surface water, about \$518,000 annually.
- For new irrigated acreages, about \$798,000 annually.

State income tax impacts for existing ground to surface water conversions and new irrigated acreages, would be approximately:

- \$25.4 million (at 7% marginal tax rate applied to all county/state income at about \$2,200 per acre, with 165,000 acres).

1.2.4 Demand for New Irrigation Ground.

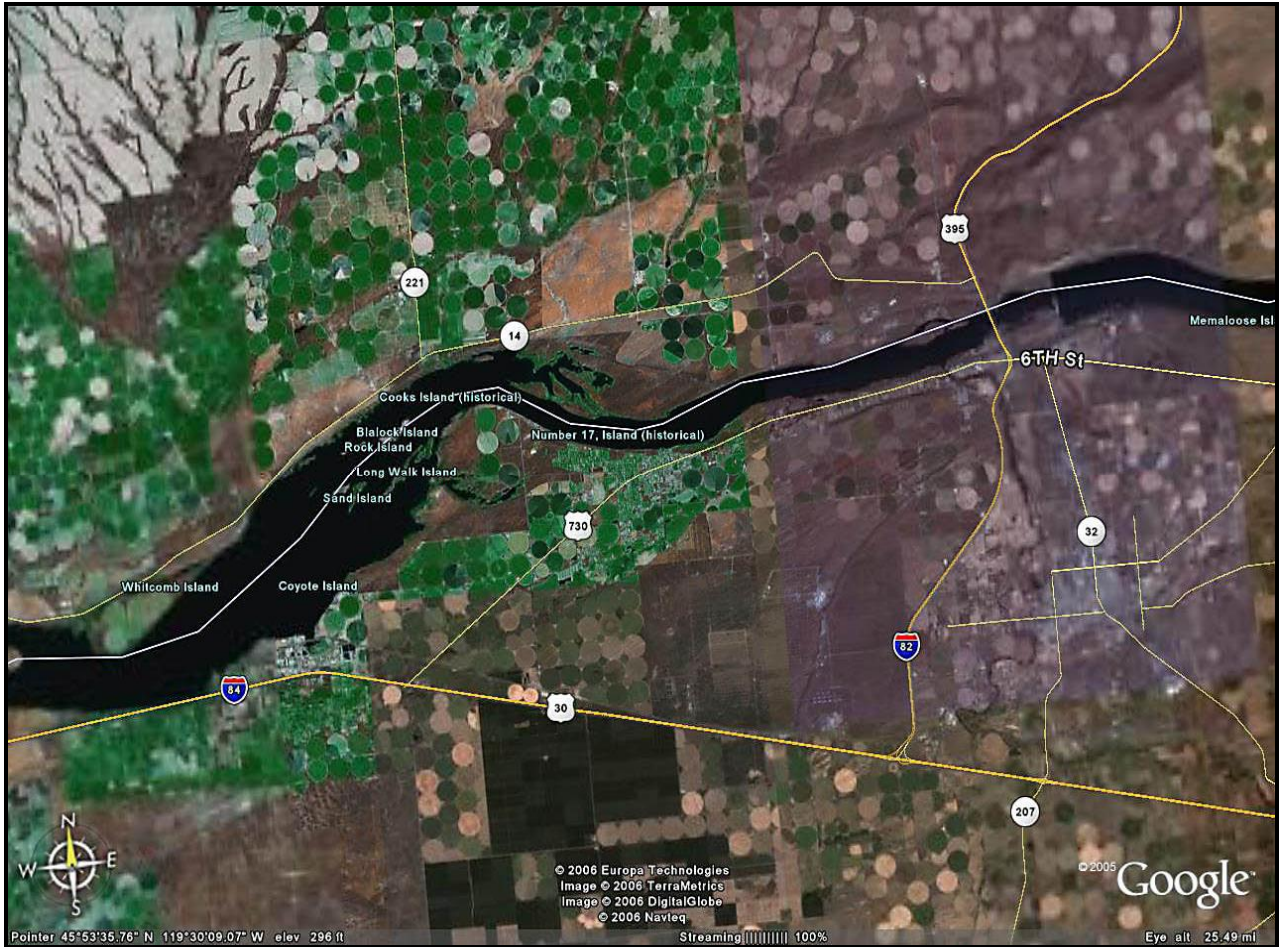
Relative to the demand for new irrigated farmland in Eastern Oregon, and within the McNary-John Day Pools area⁶, we observe that:

- The current prices for most irrigated crops that are, and would be, grown in the Eastern Oregon area suggests stable to moderately increasing price structures.
- New or previously grown crop types are becoming available for production with the siting of new bio-fuels plants in the Boardman, Oregon, and Plymouth and Finley, Washington, areas (2007 and 2008 operation starts at announced plants).
- Recent sales, and rentals, of Columbia River irrigated lands suggesting higher range values. Recent requests for new irrigated land within the Columbia-Snake River Corridor have been by producers.

⁶ Based on survey data prepared for the Benton County Commission, Washington; personal communications with members of the Columbia-Snake River Irrigators Association (CSRIA); real estate information received from Clark-Jennings and Associates, Pasco, WA; and information received from the Benton County Water Conservancy Board, Kennewick, Washington, and IRZ Consulting; and information received September-October 2006.

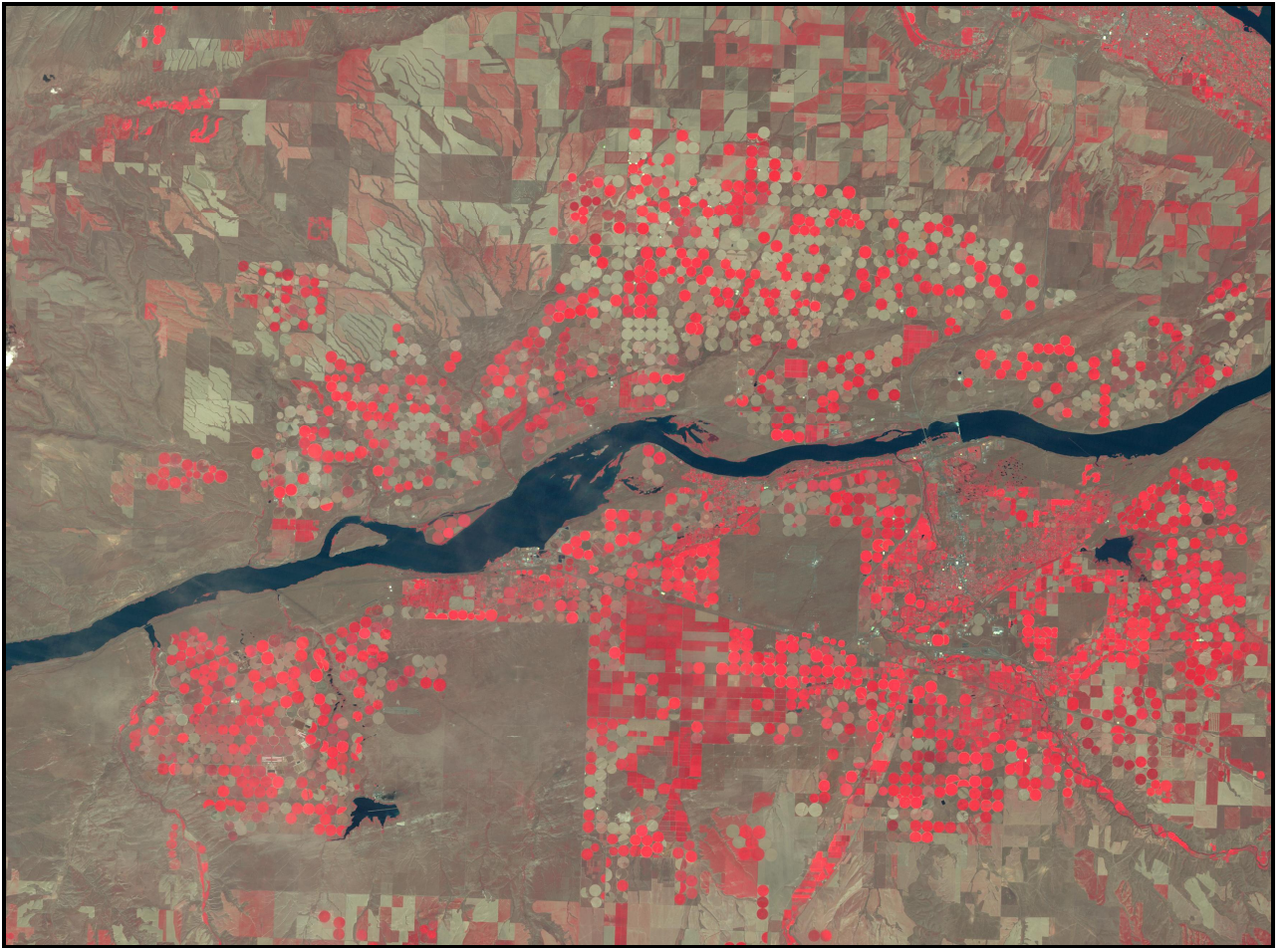
- Requests for new water rights from existing/new land owners in the Columbia-Snake River region; as well as several recent/active water right transfers for water spreading and processing needs.

**Figure 1. Irrigated Acreage from McNary and John Day Pools
(OR and WA)**



**Columbia River North and South Irrigation Corridor Near
Hermiston, Oregon**

**Figure 2 Eastern Oregon-Washington Irrigation
McNary-John Day Pools, Columbia River
(Irrigation in Red)**



**About 215,000 Irrigated Acres
Morrow/Umatilla Counties, Oregon
and
About 146,000 Irrigated Acres
Benton County, Washington,
Horse Heaven Hills Corridor**

2.0 Detailed Review of Selected Regional Economic Impact Studies Relevant to the Eastern Oregon Proposal.

There are a few recent studies and reports that deal directly with important economic indicators for irrigation and municipal development from McNary–John Day Pool water rights. These include studies prepared by the University of Washington, the U.S. Army Corps of Engineers, the Pacific Northwest Project and Associates, and the U.S. Bureau of Reclamation.

These indicators focus primarily on measures of direct net value and regional (secondary) economic development, or regional income impacts. There also are additional studies that evaluate the value of irrigated agriculture and water from a broader perspective than just the McNary--John Day Pools, and they are relevant to the subject issue.

These economic studies and indicators are reviewed below in more detail, and provide the basis for the summary estimates above.

2.1. Direct Net Value Estimates.

Economic benefits and impacts for water resource projects are primarily described in terms of direct, direct net, and secondary (or regional income) values. These are measures of economic value that are conventionally applied within standard water resources evaluations, and they have a long history of acceptance by economists and resource managers. Direct value refers to the economic value related to the primary production of agricultural goods, such as the gross crop (farm-gate) value of irrigated agriculture--it is the total (gross) revenue gained from commodity product sales.⁷

Direct net value represents the net benefits derived from primary irrigation production, over and above the costs of production to the farm operators. Direct net value is a measure of irrigated agriculture's net contribution to national economic development (or social welfare). Direct net value can be measured for most types of economic activity associated with water resource use, including hydroelectric power production, flood control, and recreation-environmental values (in many cases). Direct net value can be used to standardize and compare the relative benefits of different types of economic activities. It attempts to represent a pure expression of economic efficiency when comparing water resource use alternative. As such, direct net values are preferred and used by federal agency decision makers to compare different measures of economic benefits to the nation in general.

Direct net value is an economic measure that is usually reserved for public sector benefit-cost analyses, but it does represent the financial returns (salaries and net profit) to farm

⁷ Olsen, Darryll and Houshmand Ziari (Olsen and Ziari). "Western Irrigation Economic Benefits Review irrigated Agriculture's Role for the 21st Century, A Policy White Paper for Decision Makers." Sponsored by the Family Farm Alliance. Prepared by The Pacific Northwest Project (Kennewick, Washington) and IRZ Consulting (Hermiston, Oregon). June 1998.

management and owners. Independently, it can depict a general sense of the economic feasibility for future project development, as perceived by the private sector.

2.1.1. Huppert Study on the Columbia River Initiative (CRI).

As part of the state of Washington’s 2004 Columbia River Initiative (CRI) process, University of Washington economists⁸ prepared estimates of the existing direct net value for areas that could receive new Columbia River water rights. These estimates were based on general production budgets and relative generic assumptions. The study was sponsored by Washington State Department of Ecology.

The analysis focused on a series of five “Management Scenarios” developed by the Department of Ecology (WADOE) in consultation with water users. Currently in Washington State, water rights exist for roughly 4.7 million acre-feet of water for diversions from the Columbia River (including groundwater rights within 1 mile of the river and the Columbia Basin Project). Ninety-one percent (91%) of this water goes to irrigated agriculture and the remaining 9% to municipal, industrial, domestic and other users.

The first three scenarios increase new water rights by 1 million acre-feet (MAF) and allow existing interruptible water rights (about 3.6% of the surface water rights) to be converted to non-interruptible rights. For each of these three scenarios, the new water rights holders must meet water efficiency standards (called Best Management Practices, or BMPs) and begin metering their withdrawals. In Scenarios 2 and 3, fees are charged (\$11 or \$21 per acre-foot per year) for new and converted water rights, and 300 KAF of the 1 MAF is withheld until the majority of existing water users meets the BMPs. Scenario 4 envisions no overall increase in water diversions, but it permits new users to obtain rights via transfer from existing users, thus mitigating for the new diversions in time and place. Scenario 5 is the “no change” or status quo option.

Table 1 presents the allocation of the new water rights among different users (irrigated agriculture and municipal/industrial users) and is divided between the Columbia Basin Project (CBP) and non-CBP.

Table 1. Water Right Allocations under Each Scenario

	Total New Rights by Use (acre feet)		Total New Rights (acre feet)
	Irrigation	Municipal/Industrial	
Scenario 1			
CBP	209,000	11,000	220,000
NON-CBP	699,248	80,752	780,000

⁸ Huppert, Daniel, Gareth Green, William Beyers, Andrew Subtoviak and Andrew Wenzl (Huppert et. al.). “Economics of Columbia River Initiative.” Final Report to the Washington Department of Ecology and CRI Economics Advisory Committee. January 13, 2004.

Scenario 2			
CBP	209,000	11,000	220,000
NON-CB	399,248	80,752	480,000
Scenario 3			
CBP	209,000	11,000	220,000
NON-CB	271,570	80,572	352,142

Source: Huppert et. al., pp. 15 – 19.

In each scenario the authors examined the economic and physical impacts of the new water rights on the increase irrigated agriculture, municipal and industrial users, loss of power production, flood control, river navigation and commercial and recreational fishing.

Our analysis of the UW work focuses only on the benefits to irrigated agriculture and is shown in Table 2. These are average values of direct net revenues per acre-ft. of diversion for all crops grown in the Columbia Basin (Columbia Basin Project crop mix and weighting).

Table 2. Average Direct Net Revenues per Acre Foot of Diversion for All Crops Grown in the Columbia Basin

Author	Average Direct Net Revenues (\$2005)
Scenario 1	\$51
Scenario 2	\$49
Scenario 3	\$46

Source: Huppert, et. al. pp. iii and iv and 47-49.

However, when focusing on high value crops such as orchards, vegetables, and potatoes for Benton County, Washington--which would be similar to crops that could be grown in Umatilla County and other Oregon counties along the Columbia River--the values per acre-ft. are \$92, \$101, and \$163, respectively.

For the non-Columbia Basin Project water, the UW built in some shifts in cropping patterns that are considered a realistic depiction of the likely response to fees for new water rights. For the non-CBP water, the net revenue per acre-ft. becomes much higher, about \$66 to \$74, as seen in Table 3. This compares to the net value of new water diversions to irrigated agriculture for the Columbia Basin, from \$51 with 1 MAF under Scenario 1, to \$49 with 700 KAF under Scenario 2, to \$46 with 572 KAF under Scenario 3, as displayed in Table 2.

The value per acre-foot drops as the total water allocation increases because a larger fraction of the new water is going to the lower-value agriculture in the Columbia Basin

Project. These figures do not include the farmer’s cost for the proposed fees for new water under Scenarios 2 & 3. With the \$11 and \$21/AF fees under Scenarios 2 and 3, the after-fee net values would be lower, as shown the last row of Table 3.

Table 3. Net Revenue per Acre-Foot of New Water Allocation

	Three Levels of New Water Right (\$2005)		
	1 MAF	700 KAF	572 KAF
CBP	\$11	\$11	\$11
Non-CBP	\$66	\$68	\$74
Overall	\$51	\$49	\$46
Minus Fees	\$40	\$38	\$25

Source: Huppert et. al. p. 156

2.1.2 John Day Drawdown, Phase I Study on the Columbia River.

The U.S. Army Corps of Engineers commissioned a study⁹ assessing the economic impacts to agriculture and other economic sectors as a result of drawing down the John Day Reservoir on the Columbia River, for purposes of attempting enhanced salmon recovery. The study reviewed impacts to agriculture under two scenarios:

- Irrigated agriculture could not adjust and all existing acreage ceases production as a result of the drawdown.
- Irrigated agriculture would adjust to the drawdown by constructing water delivery canal systems.¹⁰

Our consideration of the economic implications of drawdown focuses on the first scenario, since it is the most realistic to the costs and benefits of bringing new lands into production, as a result of a new water right in Oregon.

The John Day analysis covers the following counties in Oregon: Gilliam, Hood River, Morrow, Sherman, Umatilla and Wasco. The total number of irrigated acres in these counties was about 275,000 acres. The market value of product (for 1997 updated to \$2005) for this acreage was about \$655 million, or 18.8% of the market value of crops grown in the state. The order of importance of crops grown on these acres in Oregon, in terms of acreage of production, is alfalfa, potatoes, all wheat, field and sweet corn

⁹ U.S. Army Corps of Engineers (Corps). “Salmon Recovery through John Day Reservoir, John Day Drawdown Phase I Study.” Portland District. September 2000.

¹⁰ U.S. Army Corps of Engineers (Corps -- Economics). Salmon Recovery through John Day Reservoir. John Day Drawdown Phase I Study. Economic Analysis Technical Appendix Regional Section. Portland District. September 2000.

accounting for \$570 million, about 12.8% of the market value of crops grown in the state. The total value also includes the value of poplars (harvested for wood chips).

Direct net income from farming was estimated at \$290 to \$410 per acre (Corps, p. 196). Assuming irrigation water use at 3.5 acre-feet per irrigated acre, this roughly equates to a direct net value of \$83 to \$117 per acre foot (see Table 4).

Table 4. Direct Net Value for Agriculture, Oregon and Washington Combined (\$2005)

Direct Net Value (per acre)	\$290 -- \$410
Direct Net Value (per acre -- foot)	\$83 -- \$117

Sources: Corps – Economic, pp. I-9, IV-2; Corps -- Water, p.11¹¹.

2.1.3 Estimating the Value of Water for Key Resource Sectors from the Mainstem of the Columbia River.

As part of the CRI Economics Advisory Committee review, Olsen and White¹² submitted estimates of direct net value to UW and the WADOE for consideration (as noted in the previously discussed report to WADOE. This work relied on irrigated versus non-irrigated land values and available water market information. They established that the annual direct net value for irrigation would be about \$86/acre-ft., with a range of about \$56 to \$124/acre-ft., with a midpoint estimate of \$90 acre-ft. These estimated values are further confirmed by actual water market transactions in Washington State.

Municipal and industrial (M & I) water values usually exhibit the highest value for the use value sectors. The reason is the ability and willingness of the M & I users to pay for the water. The direct net value for the M & I sectors is effectively the marginal value of water for the irrigation sector (i.e., water sold from the irrigation sector to the M & I sectors). Hence, the value level of water for the M & I sector is at least \$91 acre-foot and probably much higher. Table 5 summarizes these values.

11 U.S. Army Corps of Engineers (Corps -- Water). "Salmon Recovery through John Day Reservoir. John Day Drawdown Phase 1 Study." Economic Analysis Technical Appendix Water Section. Portland District. September 2000.

12 Olsen, Darryll and Tom White (Olsen and White). "A Technical Memorandum, Economic Analysis Methodology Illustration and Review: Estimating the Value of Water for Key Resource Sectors from the Mainstem Columbia River." Pacific Northwest Project Technical Memorandum. Kennewick, Washington. October 13, 2003. Revised April 2, 2004 for PNW Economics Conference (PNEC).

Table 5. Direct Net Values for Irrigated Agriculture and M & I from Water

Sector	Direct Net Values (per acre-foot -- \$2005)
Agriculture	\$56 -- \$124 (midpoint \$90)
M & I	> \$91

2.1.4 Economic Impact Study for Eastern Oregon.

In 1998, IRZ Consulting and the Pacific Northwest Project¹³ undertook an economic impact study of Umatilla, Morrow, and Gilliam counties of Eastern Oregon (hereinafter known as the Tri-County region). The objective of the report was twofold. First, to describe the economic base and economy of the Tri-County area—this established a basis for better understanding the economic value at risk as a result of resource management decisions for the Columbia River. And second, a review of the opportunity costs of current and future Columbia River system management actions, such as the National Marine Fishery Services’ “no net loss” water policy, and the impact caused by potential waterborne transportation closure.

Our review of this study focuses on the Inland Project, part of the report where direct net values and regional economic benefits are presented. The Inland Irrigation Project is in Morrow County, Oregon.

Table 6 summarizes the direct benefits and direct net value of Columbia River water associated with the Inland Project. The direct net value measures the current and future water allocation’s net contribution to national economic development. Based on the criteria, the benefit of reallocating Columbia River water to the Inland Project exceeds the value of the water for in-stream uses by \$76 to \$132 per acre-foot. From a national investment perspective, the Inland Project would be deemed socially beneficial and should be undertaken.

Table 6. Economic Trade-offs of Columbia River Water Diversion For Inland Irrigation Project

	\$/acre-ft (\$2005)
Direct Benefits of Water Diversion	
• Irrigated agriculture	\$87 -- \$143
Direct Opportunity Costs of Water Diversion	

¹³ Ziari, Houshmand A., Fred A. Ziari, and Darryll Olsen (Ziari et. al.). Economic Impact Study for Eastern Oregon. Opportunity Costs of Columbia River Management Actions. Prepared by IRZ Consulting, LLC (Hermiston, Oregon) and PNW Project (Kennewick, Washington) for the Ports of Morrow, Umatilla and Arlington and the Oregon Economic Development Department. October 23, 1998.

• Foregone hydropower production	\$5
• Sport and commercial fisheries (use value in Columbia River)	\$3
• Flow augmentation program (existence value)	\$3
Direct Net Value of Water Diversion	\$76 -- \$132

Source: Ziari et al., p. 53

2.1.5 Snake River Flow Augmentation Impact Analysis.

The U.S. Army Corps of Engineers¹⁴ conducted the Lower Snake River Juvenile Migration Study in response to concerns about the propagation of the Snake River salmon and steelhead.

One measure put forth for improving juvenile migration was to provide flow augmentation water from the Snake River upstream of Lower Granite Lake with the purpose of improving stream flows to move juveniles salmon and steelhead more rapidly toward the ocean. In 1995, the U.S. Bureau of Reclamation agreed to provide 427,000 acre-ft. of flow augmentation water and has been doing so since then.

The Corps requested that the USBR analyze the effects of providing additional flow augmentation at a level 1,000,000 acre-ft. greater than the current level of 427,000 acre-ft. The USBR developed and analyzed the following scenarios:

- Base Case: Provide 427,000 acre-ft. of flow augmentation water each year (existing condition since 1993).
- No Augmentation: Provide no water for flow augmentation (conditions prior to 1991).
- Provide up to 1,427,000 acre-ft. (1427i alternative) of flow augmentation water to meet deficits in flow targets at Lower Granite Dam. Irrigation shortages would be minimized by using large drawdowns of Reclamation reservoirs.
- Provide up to 1,427,000 acre-ft. (1427r alternative) of flow augmentation water to meet deficits in flow targets at Lower Granite Dam. Reservoir elevations would be maintained at or near the Base Case levels with shortages assumed by irrigation.

Irrigated agriculture within the Snake River basin was divided four major sub-basins: Eastern Idaho--Wyoming, South-Central Idaho, Southwest Idaho-Oregon (inclusive of

¹⁴ U.S. Bureau of Reclamation. 1999. Snake River Flow Augmentation Impact Analysis Appendix. Lower Snake River Juvenile Salmon Migration Feasibility Study and Environmental Impact Statement. Prepared for the U.S. Army Corps of Engineers, Walla Walla (Washington) District. Prepared by Bureau of Reclamation, Pacific Northwest Region, and Boise, Idaho. February 1999.

Malheur County in Oregon) and Eastern Oregon and Washington (inclusive of Baker, Union and Wallowa counties in Oregon, referred to as the Grande Ronde basin).

Table 7 shows the regional values of economic effects on agriculture of Scenarios 1427i and 1427r to the base case. From the base case for Scenario 1427i, one could expect an estimated decrease in employment of approximately 2,545 and income of \$60 million, which translates into a value per acre-foot of water consumed at \$169. This compares to the base case of \$126 per acre-foot. Under the more restrictive Scenario 1427r, there would be an estimated value per acre-foot of approximately \$110.

Table 7. Regional Values of Base Case/Alternative Scenarios—Snake River Basin

	Employment	Direct Net Value (\$2005)	Average Annual Consumptive Use of Water (acre-feet)	Value per Acre-foot (\$2005)
Base case	660,000	\$845,000,000	6,689,000	\$126
1427i (decreases in values)	2,545	\$60,000,000 ¹⁵	345,000 ¹⁶	\$169
1427r (decreases in values)	3,610	\$70,000,000	620,000	\ 110

Source: USBR, Summary – pp. 21, 6-13, 6-17, 6-21).

2.1.6 Western Irrigation Economic Benefits Review.

Olsen and Ziari prepared a white paper¹⁷ that seeks to convey to decision makers a better understanding of the West’s and nation’s value of irrigated agriculture, within the emerging water needs and demands of the West. To assess the significance of the West’s agricultural economic contribution to the Nation’s economy, the production value of irrigated agriculture is identified, and as well as how this production value works its way through state and regional economies. The paper presents a starting point for better

¹⁵ Referred to as income loss.

¹⁶ Average water supply year.

¹⁷ Olsen, Darryll and Houshmand Ziari (Olsen and Ziari). “Western Irrigation Economic Benefits Review Irrigated Agriculture’s Role for the 21st Century – A Policy White Paper for Decision Makers.” Prepared by the PNW Project (Kennewick, Washington) and IRZ Consulting (Hermiston, Oregon) for the Family Farm Alliance. June 1998.

understanding the economic contribution of irrigated agriculture to the West’s economy, and the economic trade-offs of water resources management.

Table 8 displays estimated direct net economic values for several types of geographically specific agricultural economic sector activities. These values are estimated in terms of dollars per acre-ft. of use. The estimated direct net economic values for irrigated agriculture in the PNW ranges between \$49 to \$85 per acre-ft. (average value). Note that the marginal value estimates range as high as \$146 acre-foot. These higher values are reflective of areas where there is not an abundance of water (i.e., the Central Valley of California and the Animas–La Plata project in Colorado and New Mexico).

Table 8. Estimated Economic Benefits of Water Use for Major Sectors, Based on Selected Studies (Direct Net, Annual Economic Value Estimates, 2005\$)

Economic Sector	Estimated Benefits (\$ per acre-foot)	Sector Area and Description
Irrigated Agriculture --1	\$49 - \$85	PNW region, range of estimates based on existing average values
Irrigated Agriculture --2	\$79	California Central Valley Project, estimate of existing average value
Irrigated Agriculture --3	\$79 -- \$122+	California Central Valley Project, marginal value estimate – can exceed \$100 acre-foot
Irrigated Agriculture --4	\$79	Texas, Tom Green County, estimate of existing average value
Irrigated Agriculture --5	\$45 -- \$52	Colorado Front Range area in Crowley County, average value estimate with risk premium for potential transfer
Irrigated Agriculture --6	\$110	Rio Grande Project, New Mexico estimate of existing average value ¹⁸
Irrigated Agriculture --6	\$146 – high value range	Proposed Animas-La Plata project in Colorado-New Mexico, estimated marginal value
Urban – Municipal; Uses	>\$122	Assumes that value would be based on marginal value of irrigation (water transfer) or new water supply resources

Source: Olsen and Ziari, Table 6.

18 U.S. Bureau of Reclamation, Inspector General’s Office. 1992. Review of Rio Grande Project Operation and Maintenance Costs. USBR. Denver, Colorado Office.

2.2 Regional Economic Development (Secondary) Income Estimates.

Secondary, or regional (regional economic development), economic benefits refer to measures of local income, employment, or expenditures generated by direct economic activities—such as irrigated agriculture. Secondary benefits are distinct category of economic activity and are separated from direct benefits when considering contributions to economic activity or growth. These types of economic benefits are related to almost all types of direct economic activities, and they are usually the type of economic value of greatest concern to state and local decision makers. State and regional decision makers typically want to know how changes to agricultural production (or other direct economic activities) can affect their state and local community economics, rather than how changes impact net (national) economic development or efficiency.

2.2.1 Huppert Study on the Columbia River Initiative.

To assess the regional economic impacts of the CRI, Huppert et. al. first estimated the “direct impacts” which he defines as encompassing the increased sales of raw and processed agricultural products. As a second step, Huppert et. al. assesses the full effects, by considering the expanding related sectors and income-driven economic expansion of the entire economy and reported the impacts in three categories: total output, employment, and value-added. The total output impact measures the change in sales of all products, inclusive of raw materials, wholesale products, plus a retail sales “margin.”

Employment impact is calculated from the total output impact by dividing the sales in each of 62 sectors of Washington State’s economy by a standard ratio of full-time employees per \$1 million in sales. The value-added impacts (sales minus purchases of inputs) for each sector are summed up to yield a measure that is similar to regional income (Huppert et. al., pp. v-vi).

Table 9 displays the direct and total employment impacts and value-added impacts for each level of water diversion. The impact of a 1 MAF increase in water (Scenario 1) represents roughly a 20% expansion in the State’s agricultural economy. A limiting factor in these estimates is that they do not incorporate the probable price-depressing effects of increased agricultural production, which means that they are an upper bound and the direct regional economic impacts are probably less than the numbers appearing in Table 9 (Huppert et. al., pp. v-vii). The direct employment impacts range between 18,420 (Scenario 1) to 8,735 (Scenario 3), with total regional employment impacts being between 44,840 and 21,205, respectively.

The value added direct impacts were between \$890 to \$740 per acre-foot and \$3,120 to \$2,580 per new irrigated acre (assuming 3.5 acre-feet of water applied per acre) for Scenario 1 to Scenario 3, respectively. The total regional impacts. were between approximately \$2.2 billion (Scenario 1) to \$1.0 billion (Scenario 3).

Table 9. Summary of Washington State Economic Impacts of Agricultural Expansion

Scenario	Employment		Value Added ¹⁹ (\$2005)			
	Direct	Total Regional Impact	Total (\$ millions)	Total (per acre foot of diversion)	Total per Acre	Total Regional Impacts Total (\$ millions)
Scenario 1 (1MAF)	18,420	44,840	\$890	\$890	\$3,120	\$2,155
Scenario 2 (700 KAF)	11,660	28,345	\$560	\$805	\$2,820	\$1,360
Scenario 3 (572 KAF)	8,735	21,205	\$420	\$740	\$2,580	\$1,020

Huppert, et. al. p.v-vi, 58-59.

2.2.2 John Day Drawdown, Phase I Study on the Columbia River.

Table 10 shows the direct, indirect, and induced regional effects on sales, jobs, and personal income by terminating irrigation to the crops grown and thus the output of each irrigated crop due to dam breaching. With breaching, approximately 182.1 thousand irrigated acres could be taken out of production. Termination of irrigated agriculture causes a reduction in sales of approximately \$1.1 billion, a loss of 9.3 thousand jobs, and a drop in farm personal income by \$410 million. The estimated loss in sales per acre is approximately \$5,855. The estimated annual loss of personal income per acre is \$2,255.

Table 10. Direct, Indirect and Induced Effects if Irrigated Agriculture is Terminated by Breaching

	Total Regional Impacts	Values Per Irrigated Acre
Loss of Sales (\$2005 Dollars)	\$1,065 billion	\$5,855
Loss of Employment (Part and Full-Time Jobs)	9,276	5.1%
Loss of Personal Income (\$2005)	\$410 million	\$2,255

¹⁹ Defined as sales minus purchases of inputs in each of 62 sectors and summed to yield a measure that is similar to regional income (Huppert, pp. v –vi).

Sources: John Day Report, Economic Analysis Technical Appendix, Regional Section, pp. IV-1 to IV-

2.2.3 Economic Impact Study for Eastern Oregon.

To limit the scope of the analysis for irrigated agriculture and the Inland Irrigation Project, the estimates of increases in regional value-added activities beyond the farm gate were made using three scenarios:

- Scenario 1 -- a 25 percent increase in value-added activities.
- Scenario 2 – a 50 percent increase in value-added activities.
- Scenario 3 -- a 75 percent increase in value-added activities.

Table 11 presents the regional economic impact of the Inland Project for three scenarios outline above. If the water right for the 20,000 acres could be exercised, the Inland Project would stimulate regional economic activities from \$85 to \$150 million, depending on the scenario. Of this amount, from \$55 to \$95 million is direct impact and \$30 to \$55 million would be the secondary impact²⁰. The \$85 to \$150 million of additional economic activities would also add from 646 to 1,097 jobs (284 to 472 direct and 362 to 625 indirect jobs)²¹. The Inland Project would increase regional personal income from \$18 to \$32 million annually. The labor income portion of personal income is estimated at around \$16 to \$28 million.

Table 11. Regional Economic Impact of the Inland Project to Morrow County

Value Added Scenarios	Output		Personal Income		Employment	
	Direct (\$million-- \$2005)	Total (\$million -- \$2005)	Direct (\$million -- \$2005)	Total (\$million -- \$2005)	Direct (# of jobs)	Total (#of jobs)
Scenario 1	\$55	\$85	\$8	\$18	284	646
Scenario 2	\$75	\$115	\$11	\$25	380	875
Scenario 3	\$95	\$150	\$15	\$32	472	1,097

Source: Ziari et. al., p.57.

Table 12 shows a conversion of the economic values, expressed in Table 11, to dollars per acre-foot, assuming 50,000 acre-feet annually withdrawn from the Columbia River

²⁰ Derived by subtracting direct output from total output for each scenario.

²¹ Derived by subtracting employment from total employment.

for the Inland Project. The acre-foot output value of the Inland Project would regionally range between \$1,685 to \$2,975 per acre-foot, depending on the scenario. Of this amount, from \$1,100 to \$1,910 is direct impact and \$585 to \$1,065 per acre-foot would be the secondary impact. The total output per acre ranges between \$5,890 and \$10,410 per acre.

The Inland Project would increase direct regional personal income from \$165 to \$290 per acre-foot annually, with total personal income ranging between \$360 and \$630 per acre-foot. The increase to total personal income per acre ranges between \$1,265 and \$2,210 per acre.

Table 12. Regional Economic Impact of the Inland Project to Morrow County, Expressed as Dollars/Acre-Foot (\$2005)

Value Added Scenarios	Output (\$2005)			Personal Income (\$2005)		
	Direct (\$ per acre-foot)	Total (\$ per acre-foot)	Total Per Acre ²²	Direct (\$ per acre-foot)	Total (\$ per acre-foot)	Total Per Acre ²³
Scenario 1	\$1,100	\$1,685	\$5,890	\$165	\$360	\$1,265
Scenario 2	\$1,530	\$2,350	\$8,220	\$230	\$500	\$1,750
Scenario 3	\$1,910	\$2,975	\$10,410	\$290	\$630	\$2,210

2.2.5 Efficacy and Economics of Riparian Buffers on Agricultural Lands

Natural resource agencies, including the Washington State Department of Fish and Wildlife and the National Marine Fisheries Service, have proposed mandatory, fixed-width riparian buffers on agricultural lands throughout the State of Washington. The Washington State agricultural community was concerned about the potential mandating of fixed-width riparian buffer zones due to issues related to private property, economic impacts, and the most effective means of salmon habitat recovery and protection. As a result, the Agricultural Caucus, of the Agricultural-Fish-Water Process, retained GEI and the Pacific Northwest Project²⁴ to review the functions and design dimensions for riparian buffers, and to estimate regional economic impacts of the agriculture industry.

²² Calculated by the total output per acre-foot times 3.5 acre-feet, the amount of water annually used in the region for crop production.

²³ Calculated by the total output per acre-foot times 3.5 acre-feet, the amount of water annually used in the region for crop production.

²⁴ GEI Consultants, Inc. (GEI). "Efficacy and Economics of Riparian Buffers on Agricultural Lands. State of Washington, Phase I." In conjunction with the Pacific Northwest Project (Kennewick, Washington) and Mason Bruce & Girard, Inc. Prepared for the Washington Hop Growers Association, Ag Caucus, Multi-Agricultural Caucus, Yakima, Washington. Englewood, Colorado. October 2002.

GEI/PNP estimates enabled another estimate of the direct and indirect value of irrigation water, expressed as direct and indirect value per acre-foot. Table 13 is a presentation of those values.

In Benton and Yakima counties agricultural production value is \$205 and \$430 per acre-foot, respectively. Agricultural services in the two counties are \$46 and \$67, while food processing direct value is \$168 to \$145 for Benton and Yakima counties, respectively. Total direct and indirect values range from \$182 per acre-foot in Benton County to \$1,224 per acre-foot in Yakima County. The potential reason for the higher value in Yakima County is the incidence of production of higher valued crops such as apples, cherries, etc.

Average county/state income values per acre for Benton and Yakima counties are about \$2,150 per acre.

Table 13. Agricultural Industry Direct and Secondary Economic Impacts

Selected Washington Counties	Agricultural Industry Direct Income (\$ per acre-foot -- \$2005)			Total Direct & Indirect Agricultural Industry (\$ per-acre-foot -- \$2005)	Average County Income (value per acre - \$2005) ²⁵
	Agricultural Production (Direct value expressed in \$ per acre-foot of water)	Agricultural Services (Direct value expressed in \$ per acre-foot of water)	Food Processing (Direct value expressed in \$ per acre-foot of water)		
Benton	205	46	168	182	\$2,150
Yakima	430	67	145	1,224	\$2,150

Source: GEI, pp.36 – 38, 42.

3.0 Local and State Tax Revenues; Demand for New Irrigated Ground.

3.1 Local Property Tax.

Assessed value of irrigated farmland under center-pivot irrigation was obtained from the Umatilla County (Oregon) Assessors Office²⁶. Assessed value is

²⁵ Based on irrigated crop lands for Benton County and Eastern Oregon.

²⁶ Personal communication with Assessors Office, Umatilla County, Oregon October 2006.

significantly different than market value for irrigated agriculture under Oregon's Exclusive Farm Use (EFU) designation. Farmers who have their land classified under EFU receive a substantial property tax break. For example, center-pivot irrigated agriculture assessed at between \$420 and \$570 dollars per acre, whereas the market value of the same land is greater than \$3,000 per acre. This number is based on the actual sale of center-pivot irrigation property, averaged between 2003 and 2006.

Based on the assessed value, an average millage rate of \$14²⁷ and the assumption that 100,000 acres would be brought into production with a new water right from the Columbia River, the amount of property taxes that could be expected to be collected would range between \$588,000 and \$798,000.

3.2 State Income Tax Estimates.

Oregon's marginal income tax rate ranges between 4-9%. Depending on crop mix, the annual county-state income per irrigated acre ranges between \$2,150 and \$2,710 per acre.²⁸ Using the 4% to 9% marginal tax rates, and 100,000 new irrigated acres coming into production with the new Columbia River water right, would result in an estimated increase in State income tax collected of \$8.6 million \$10.8 million at 4 percent and \$19.4 million to \$24.4 million at 9 percent.

3.3 Demand for New Irrigation Ground.

Relative to the demand for new irrigated farmland in Eastern Oregon and within the McNary-John Day Pools area²⁹, we observe that:

- The current prices for most irrigated crops that are, and would be, grown in the Eastern Oregon area suggest stable to moderately increasing price structures.
- New or previously grown crop types are becoming available for production with the siting of bio-fuels plants in the Boardman, Oregon, and Plymouth, Washington, areas (2007 and 2008 operation starts at announced plants).

²⁷ Represented by the millage rate in 2005 – 2006 Tax Code Areas 0504 and 0804, which are predominately irrigated agriculture tax code areas in Umatilla County (Lloyd Shank, October 2006).

²⁸ This range is based on irrigated agriculture in Washington State's Horse Heaven Hills region, located directly across the Columbia River from Oregon's Morrow and Umatilla counties. The sources used to compile the range are GEI, Ziari et. al. and Huppert et. al.

²⁹ Based on survey data prepared for the Benton County Commission Washington (2006 data); personal communications with members of the Columbia-Snake River Irrigators Association (CSRIA); real estate information received from Clark-Jennings and Associates, Pasco, WA; and information received from the Benton County Water Conservancy Board, Kennewick, Washington, and IRZ Consulting; and information received September-October 2006.

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- Recent sales, and rentals, of Columbia River irrigated lands suggesting higher range values.
- Requests for new water rights from existing/new land owners in the Columbia-Snake River region; as well as several recent/active water right transfers for water spreading and processing needs.

4.0 Benefit-Cost Analysis.

4.1 An Evaluation of Benefits and Costs for the CRI in Washington State.

When proposing a new administrative rule for consideration, the WADOE is required to determine whether the probable benefits of an action (i.e., the CRI) are expected to exceed the probable costs. An analysis by Zhang³⁰ of WADOE evaluates the probable benefits and costs of the proposed CRI. The intent of the analysis was to provide the information necessary to assist DOE in making these determinations.

The proposed CRI rule and amendments can be expected to affect agriculture, municipalities, industry, hydropower, flood control and navigation, recreation, fish population and fisheries. Based on information provided by the National Academy of Sciences (NAS study), the University of Washington (UW)—Huppert et. al. -- and other sources, Zhang's analysis quantifies the probable benefits and costs of the proposed CRI rule.

Zhang's analysis concludes that the probable benefits resulting from adoption of the proposed rule are \$200 million greater than the probable costs (\$320 million benefits versus \$120 million costs), not including various un-quantified benefits, or a benefit to cost ratio of 2.65 (\$2005 -- Zhang, p. 19). This is inclusive of all benefits (municipal and industrial, interruptible, and future new water rights, among others). Zhang is assuming the State will obtain 728 KAF water from various sources and issue 486 KAF water for out-of stream beneficial use, inclusive of the 361 KAF available for new water rights over a 20-year period, irrigating about 65,000 of farmland.

Because of its high value, Zhang states water provided to municipal and industrial uses will always generate net social benefits. The benefits to hydropower, recreation, navigation and various other sectors are byproducts of the proposed rule, and have almost no social costs associated with them. As such, particular attention has been paid to the effect of the proposed CRI rule on the agricultural sector. Zhang further states it can be safely concluded that water used for mitigating drought permits will generate net social benefits since the potential losses associated with a drought are large and the water for the drought permit is only used once in about 26 years.

³⁰ Zhang, Shidong. An Evaluation of Probable Benefits and Costs. For the Proposed Rule to Establish the Columbia River Water Resources Management Program. Prepared for the Washington State Department of Ecology. December 2004.

The UW report expressed concerns about the market condition of specialty crops, which could include orchards, vegetables, potatoes, and some of the crops in the other (high value) crop group. The data available indicate that for some specialty crops, in the short run, a higher yield may result in a lower price. However, historical price trends indicate that this is probably just a temporary impact, with long run prices stable around equilibrium despite increasing yields. The reasons are as follows:

- Real revenue per acre (or the price) of specialty crops varies by as much as 20 percent within any given year.
- The real revenue per acre consistently trends toward the long run equilibrium price. This appears to be a stationary process.
- Increasing production over time has not resulted in lower real revenue on a per acre basis; and
- Two of the three specialty crops, apples and grapes, show an increase in real revenue per acre over a long time horizon.

Zhang noted that the issuance of new water rights in the quantities contemplated by the Columbia River Initiative will not dramatically increase production above existing levels and that the constant real value of water over the 20-year period is \$65 acre foot in agricultural operations.

4.2.1 Review of the Columbia River Initiative-Ecology Studies by American Rivers

American Rivers commissioned a review to examine the likely economic impacts to the State of Washington from expanding irrigated agriculture along the Columbia and Lower Snake rivers. The studies critically examine the two previous reports^{31 32} conducted for the Department of Ecology, as part of Governor Locke's Columbia River Initiative (CRI). These state reports concluded that a large expansion of irrigated agriculture would be economically beneficial to Washington State generally and the agriculture sector in particular.

The American Rivers concluded that the University of Washington study overestimated the net revenues accruing to new irrigated agriculture in the Columbia River Basin under the CRI, and net revenues are more likely to be negative than positive. The American

³¹ Zhang, Shidong. "An Evaluation of Probable Benefits and Costs. For the Proposed Rule to Establish the Columbia River Water Resources Management Program." Prepared for the Washington State Department of Ecology. December 2004.

³² Huppert, Daniel, Gareth Green, William Beyers, Andrew Subtoviak and Andrew Wenzl (Huppert et. al.). "Economics of Columbia River Initiative." Final Report to the Washington Department of Ecology and CRI Economics Advisory Committee. January 13, 2004.

Rivers critique further concluded that the UW and Zhang studies should have supported a policy prescription that opposes the development of further water rights.

The American Rivers review attempted “to correct” four methodological assumptions in the UW work that could have a substantial impact on the net agricultural revenue calculations and, therefore, on the cost-benefit analysis:

- The assumption that the demand for the crops produced along the Columbia River is perfectly price elastic: Making this assumption guarantees the highest gross revenue calculations possible.
- The assumption that any new water would be applied to crops on new acreage in proportion to their shares of total, present existing acreage.
- The assumption that Huppert et al. calculations focus exclusively on the Columbia River region (American Rivers assumes that any production increase in the Columbia River region could be offset by reductions in production elsewhere in the State).
- The assumption that the Huppert, et al., methodology confused production levels and revenues that would have existed even without new water rights with those that result solely as a consequence of the new water rights.

American Rivers concluded that the UW report substantially overestimated the net revenues to producers in the Columbia River area from an increase in irrigated acreage under the CRI, and that the overestimate was severe enough that the net revenues are more likely to be negative than positive. After deducting the cost of the additional production, the net returns to producers from new agricultural water rights under the CRI would likely be negative, costing the state about \$1.5 billion over a 20-year period, representing an average annual loss of about \$75 million (\$2005), instead of adding a net benefit to the state as concluded by UW.

4.2.2 Technical Problems Affecting the American Rivers Critique

While the American Rivers critique dealt with a number of potential issues affecting the UW study, there are several key problems/issues affecting their critique, they need full consideration. These can be briefly summarized as follows:

- The actual amounts of added irrigated acres for new water rights, outside of the Columbia Basin Project area, are relatively small, over time. It is questionable whether this acreage would actually affect the global and regional production markets in the manner prescribed by American Rivers. Also, the near-term, conceivable allocations of new surface water for the Columbia Basin Project area will focus on relief of existing groundwater acreage (already in production), not new acreages.

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- There will be some shifts in production agricultural from the tributary areas to the mainstem Columbia-Snake River corridors, with or without the allocation of new water rights. To suggest that this shift is solely due to new water rights is wrong. The corridors account for prime production areas in the state, with significant production optimization potential, and not affected by other types of market impacts.
- The American Rivers review did not consider export markets or multiplier (processing) effects of those markets. Over half of agricultural production in Washington State is exported, included high-value products.
- The review does not appear to account for increases in population (food demand) over the next 20 years, which will likely expand some demand for products grown in the Pacific Northwest and Columbia River Basin.
- It is assumed that new water would be put on marginal crops such as wheat, some types of hay, and other crops. The water will be primarily used for high value crops.
- The review failed to acknowledge or address the concept of spreading fixed capital resources (tractors, pump stations, and other equipment) already purchased over new land brought into production, and that only the variable costs of production on the new lands would increase (pesticides, power for pumps, etc.).
- The review failed to address the fact that new varieties of crops are being grown. This is particularly true in the orchard and vineyard business and the recent, expanding trend in the growth of bio-fuels. The newer variety crops—and crop needs--typically command a higher price in the market, thereby increasing direct net revenues to the agricultural sector.
- To some extent, the review fails to recognize continuing technological changes in irrigation practices that will take place over time and that could potentially off-set the effects of any new water withdrawals from the Columbia mainstem.
- The American Rivers review does not match well the developing land, water, and crop production conditions along the Eastern Oregon—Horse Heaven Hills river corridor; the result of changing local, regional, and national market conditions. Actual market conditions suggest a demand for new agricultural products from this area, with stable price conditions.